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THE IMMATURE STAGES OF DIABROTICA SOROR.

BY R. W. DOANE.

[Mr. R. W. Doane, a student of entomology in this University (Stanford), undertook during the college year 1895-96 the study of the life-history of *Diabrotica soror*, the Pacific Coast representative of the destructive *Diabroticas*. Despite the abundance of *soror*, its serious ravages on flowers and fruits, and a lively interest on the part of entomologists in its habits, its life history has remained unknown. By reason of Mr. Doane's removal, his work, well begun and successfully prosecuted as far as carried, has been interrupted. The following descriptions of the egg, larva and pupa, together with a few notes on the habits of the species, are extracted from his notes.—VERNON L. KELLOGG, Stanford University, California.]

The following descriptions were made from a number of specimens taken in the field and laboratory.

Egg.—Length, .7 mm.; width, .5 mm.; oval, dirty white in color; surface finely sculptured by minute hexagonal pitted areas. These areas under a higher power lens show several irregular depressions within their own surface.

Full-grown larva.—Length, 12 mm.; width, 1.3 mm.; body cylindrical, slightly tapering toward the head; the twelve segments behind the head indistinctly separated. General color, except the head, dorsal shield and last abdominal segment, dirty white, often becoming more yellowish before pupation. Head dark brown above and on the sides, same color as rest of body below; posterior margin with a deep, quite broad, V-shaped incision, ending in a broad deep suture which runs cephalad for nearly one-third the length of the head, then divides into two well-marked sutures which extend to the base of the antennae. These sutures divide the head into three distinct parts, the anterior part being the largest, the other two parts are equal and constitute the posterior and part of the lateral portions of the head. There is a dark median line ending at the tip of a small V-shaped incision in the anterior margin of the head, and a few rather strong hairs scattered over the surface of the head. Antennae white, three-jointed; first joint a little broader than its length, second joint the shortest, narrower than the first, third joint cone-shaped, its greatest width about equal to its length. No eyes. Labrum same color as rest of the head. Mandibles dark brown, darker at tips, other mouth parts and appendages whitish.

Cervical shield brown, paler than the head, broadly shield-shaped with quite a broad median white line, a few rather long hairs and several shorter ones scattered over the surface. The remainder of the prothorax, the meso- and meta-thorax same color as the rest of the body. Legs pale, three-jointed, supported by dark brown chitinous framework; several short rather stout hairs on each segment; a whitish, elliptical, striated lobe arising beside the single brown tarsal claw. Segments four to eleven, all similar, skin wrinkled, somewhat papillose, a few scattering hairs over each segment; on the lateral margin of each segment is a long stiff hair just posterior to one and sometimes two smaller and shorter hairs. Dorsal shield of posterior segment semi-circular in outline, dark brown, finely sculptured so as to produce numerous hexagonal pitted areas much resembling the markings on the eggs; several strong marginal hairs and two sub-triangular processes near the posterior end. A single fleshy proleg.

The larva agrees almost perfectly with Prof. H. Garman's description of the larva of *D. 12-punctata* as given in Psyche, Vol. VI, p. 48. The only special difference I would note is in the description of the dorsal shield of the posterior segment which he describes as follows: "Dorsal shield of posterior body segment nearly circular in outline, brown, with numerous minute black specks, slightly rimmed at posterior margin, and in young examples obscurely bituberculate; furnished with several strong marginal hairs, and with four minute, striate, centrally-placed spatulate appendages."

Pupa.—Whitish or straw-colored. Length .4 mm., width .2 mm. Scattered brown hairs over the body arranged as follows: six on the head arranged in three transverse pairs, one pair close to the base and just cephalad of the antennæ, one just caudad of the antennæ, and one near the meso-dorsal angle of the eyes; ten on the prothorax, one pair on the anterior margin, one pair near the lateral margin, and one pair near the posterior margin, a pair just anterior and a larger pair just posterior to the middle near the mesal line; an arched row of four hairs each on the meso- and meta-thorax; a pair in the middle and one on each side of each abdominal segment; last three segments with another pair slightly anterior to and more widely separated than the median pair; last segment also with a pair between and a pair in the bases of the caudal spines, and another pair just anterior to the lateral pair. Caudal spines usually slightly curved, brownish at tips. Each femur with three hairs near the extremity. Wing pads clear white, covering the proximal part of the posterior femor. Antennæ curving outward

around the femora of the meso- and meta-thoracic legs, then meeting on the median ventral line between them.

As the pupa grows older the eyes, wing parts, parts of the legs and antennæ and the tips of the mandibles begin to turn much darker.

Soror is especially injurious to the interests of the flower-grower. The beetles eat unsightly holes in the buds and petals of roses and chrysanthemums, and other showy flowers. It feeds on leaves too, and is almost unrestricted in range of food-plants. Fruit-growers often suffer serious loss by the beetle's eating the young forming fruit. The apricot seems especially the object of attack. Hardly any kind of garden vegetable is free from its attention.

The eggs are deposited, in breeding jars or out of doors, from $\frac{1}{4}$ to $\frac{1}{2}$ an inch below the surface of the ground, near the base of some plant, sometimes singly but usually in numbers of from 20 to 50. The eggs hatched in the breeding jars in about eighteen days. The larvæ developed slowly. Larvæ of various sizes, some full grown, some newly hatched, were found around the roots of different plants out of doors in March, April and May. The larvæ do not bore into the roots, as *longicornis* and *12-punctata* do, but eat the roots from the outside, sometimes cutting the young rootlets entirely in two. The larvæ were found in abundance feeding on the roots of sweet-peas and alfalfa, and sparingly on other plants.

As the larva becomes full-grown it approaches the surface of the ground and forms an oval or spherical cell in which it lies ten or twelve days, semi-quiescent, before pupation. The pupal stage lasts from ten to fourteen days. The first out-of-doors pupæ were found early in April.

No special opportunity of combatting the pest is offered by its immature stages. The wide range of food-plants of larva and adult, and the underground life of the immature stages, make it a particularly difficult insect to fight.

NOTE ON CATOCALA ELDA Behr.

BY WM. BEUTENMULLER.

This insect was described as a distinct species from a specimen taken in Oregon. Since then three examples have been taken in British Columbia, and last summer Mr. Doll raised a single specimen from a larva found on Long Island, N. Y. It is, without doubt, nothing more than a gray variety of *C. relictæ*. Mr. Palm already called attention to this fact. (Journ. N. Y. Ent. Soc., I, p. 21.)